simulation. Section 2.2. describes SpraySIM which uses the flowfields from the CFD tool and calculates the drag the particles experience under the influence of the shaping air, gravity, and electric potential. Paint particle trajectories can then be calculated and paint transfer efficiency determined. Miller et al. does not disclose spray gun placement code means operable with a user input mechanism to dynamically effect a desired placement of at least one paint spray gun on a display with respect to a desired portion of a CAD model.

In contradistinction, claim 1 claims the present invention as a system for designing a vehicle by enabling dynamic placement of paint spray particles into a flow domain to permit visual observation and alteration of resulting particle trajectories under a computed flow solution over a computer aided design (CAD) model representative of a desired portion of the vehicle represented on a display by a computer having memory, a processor and a user input mechanism associated therewith. The system includes spray gun placement code means operable with the user input mechanism to dynamically effect a desired placement of at least one paint spray gun on the display with respect to the desired portion of the CAD model. The system also includes trajectory determination code means for computing at least one trajectory for a particle stream emanating from the at least one paint spray gun relative to the desired portion of the CAD model for a predetermined set of particle characteristics in a predetermined set of particle external conditions. The system further includes trajectory display code means for effecting display of the at least one trajectory with respect to the desired portion of the CAD model. Claims 5 and 6 are similar to claim 1 and include other features of the present invention.

A rejection grounded on anticipation under 35 U.S.C. § 102 is proper only where the subject matter claimed is identically disclosed or described in a reference. In other words, anticipation requires the presence of a single prior art reference which discloses each and every element of the claimed invention arranged as in the claim. In re Arkley, 455 F.2d 586, 172

U.S.P.Q. 524 (C.C.P.A. 1972); <u>Kalman v. Kimberly-Clark Corp.</u>, 713 F.2d 760, 218 U.S.P.Q. 781 (Fed. Cir. 1983); <u>Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.</u>, 730 F.2d 1452, 221 U.S.P.Q. 481 (Fed. Cir. 1984).

None of the references cited disclose or anticipate the claimed invention of claims 1 through 6. Specifically, Miller et al. '291 <u>merely</u> discloses transient CFD simulations of a bell sprayer in which two numerical models are required in order to analyze the effect of paint transfer efficiency under varying bell operation conditions. Miller et al. '291 lacks spray gun placement code means operable with a user input mechanism to dynamically effect a desired placement of at least one paint spray gun on a display with respect to a desired portion of a CAD model. Miller et al. '291 fails to disclose the combination of a paint spray particle trajectory analysis method and system including spray gun placement code means operable with a user input mechanism to dynamically effect a desired placement of at least one paint spray gun on a display with respect to a desired portion of a CAD model and trajectory determination code means for computing at least one trajectory for a particle stream emanating from the at least one paint spray gun relative to the desired portion of the CAD model for a predetermined set of particle characteristics in a predetermined set of particle external conditions as claimed by Applicants. Miller et al. '291 fails to disclose each and every element of the claimed combination of a paint spray particle trajectory analysis method and system as arranged in the claims and claimed by Applicants. Therefore, it is respectfully submitted that claims 1 through 6 are allowable over the rejection under 35 U.S.C. § 102(b).

Claims 1 through 6 were rejected under 35 U.S.C. § 102(e) as being anticipated by Strumolo et al. (U.S. Patent No. 6,263,300). Applicants respectfully traverse this rejection.

U.S. Patent No. 6,263,300 to Strumolo et al. discloses a particle trajectory analysis system and method for vehicle design. In box 10, a CAD model of a vehicle, or a desired portion

of a vehicle, is obtained from an electronic storage device. In diamond 12, an option is given to use a computed external flow over the CAD model. If flow is desired, then a predetermined flow field is read in from an external source in box 14. If it is determined that flow is not needed in diamond 12, flow is routed to box 16 where a simulated particle injector is placed relative to the CAD model. In box 18, information is specified about the particles, which are simulated to be ejected from the particle injector. Computations of particle trajectories are carried out in box 20. The particles may be liquid droplets, paint droplets, solid stone representations, or other physical representations. Strumolo et al. does not disclose spray gun placement code means operable with a user input mechanism to dynamically effect a desired placement of at least one paint spray gun on a display with respect to a desired portion of a CAD model and trajectory determination code means for computing at least one trajectory for a particle stream emanating from the at least one paint spray gun relative to the desired portion of the CAD model for a predetermined set of particle characteristics in a predetermined set of particle external conditions.

In contradistinction, claim 1 claims the present invention as a system for designing a vehicle by enabling dynamic placement of paint spray particles into a flow domain to permit visual observation and alteration of resulting particle trajectories under a computed flow solution over a computer aided design (CAD) model representative of a desired portion of the vehicle represented on a display by a computer having memory, a processor and a user input mechanism associated therewith. The system includes spray gun placement code means operable with the user input mechanism to dynamically effect a desired placement of at least one paint spray gun on the display with respect to the desired portion of the CAD model. The system also includes trajectory determination code means for computing at least one trajectory for a particle stream emanating from the at least one paint spray gun relative to the desired portion of the CAD model for a predetermined set of particle characteristics in a predetermined set of particle external

conditions. The system further includes trajectory display code means for effecting display of the at least one trajectory with respect to the desired portion of the CAD model. Claims 5 and 6 are similar to claim 1 and include other features of the present invention.

Strumolo et al. '300 does not disclose or anticipate the claimed invention of claims 1 through 6. Specifically, Strumolo et al. '300 merely discloses a particle trajectory analysis system and method for vehicle design having a simulated particle injector placed relative to a CAD model and computations of particle trajectories carried out with the particles being paint droplets. Strumolo et al. '300 lacks spray gun placement code means operable with a user input mechanism to dynamically effect a desired placement of at least one paint spray gun on a display with respect to a desired portion of a CAD model and trajectory determination code means for computing at least one trajectory for a particle stream emanating from the at least one paint spray gun relative to the desired portion of the CAD model for a predetermined set of particle characteristics in a predetermined set of particle external conditions. The Examiner even admits on page 9 of the Office Action that Strumolo et al. '300 does not teach particle trajectories of paint droplets. As a result, Strumolo et al. '300 cannot disclose the combination of a paint spray particle trajectory analysis method and system including spray gun placement code means operable with a user input mechanism to dynamically effect a desired placement of at least one paint spray gun on a display with respect to a desired portion of a CAD model and trajectory determination code means for computing at least one trajectory for a particle stream emanating from the at least one paint spray gun relative to the desired portion of the CAD model for a predetermined set of particle characteristics in a predetermined set of particle external conditions as claimed by Applicants. Strumolo et al. '300 fails to disclose each and every element of the claimed combination of a paint spray particle trajectory analysis method and system as arranged

in the claims and claimed by Applicants. Therefore, it is respectfully submitted that claims 1 through 6 are allowable over the rejection under 35 U.S.C. § 102(e).

Claims 1 through 6 were rejected under 35 U.S.C. § 103 as being unpatentable over Kinema/SIM (ArSciMed, 1996) in view of Strumolo (U.S. Patent No. 5,568,404) or Miller et al. '291. Applicants respectfully traverse this rejection.

Kinema/SIM Manual from ArSciMed discloses an interactive software tool that presents a simulation space where you can construct and animate complex physical phenomena. The basic building blocks are particles, sources, and obstacles. Kinema/SIM does <u>not</u> disclose spray gun placement code means operable with a user input mechanism to dynamically effect a desired placement of at least one paint spray gun on a display with respect to a desired portion of a CAD model and trajectory determination code means for computing at least one trajectory for a particle stream emanating from the at least one paint spray gun relative to the desired portion of the CAD model for a predetermined set of particle characteristics in a predetermined set of particle external conditions.

U.S. Patent No. 5,568,404 to Strumolo discloses a method and system for predicting sound pressure levels within a vehicle due to wind noise. The system and method includes a wind noise modeler, which is implemented as an Excel spreadsheet that runs on a PC. Strumolo does <u>not</u> disclose spray gun placement code means operable with the user input mechanism to dynamically effect a desired placement of at least one paint spray gun on the display with respect to the desired portion of the CAD model and trajectory determination code means for computing at least one trajectory for a particle stream emanating from the at least one paint spray gun relative to the desired portion of the CAD model for a predetermined set of particle characteristics in a predetermined set of particle external conditions.

SAE Paper No. 982291 to Miller et al. discloses transient CFD simulations of a bell sprayer. Two numerical models are required in order to analyze the effect of paint transfer efficiency under varying bell operation conditions. First, the shaping air from a bell sprayer is simulated using a new computational fluid dynamics simulation, PowerFlow, as described in section 2.1. The numerical simulation is a single species, single-phase model and subsequently, paint spray dynamics and interaction with the shaping air must be modeled using a separate simulation. Section 2.2. describes SpraySIM, which uses the flowfields from the CFD tool and calculates the drag the particles experience under the influence of the shaping air, gravity, and electric potential. Paint particle trajectories can then be calculated and paint transfer efficiency determined. Miller et al. does not disclose spray gun placement code means operable with a user input mechanism to dynamically effect a desired placement of at least one paint spray gun on a display with respect to a desired portion of a CAD model.

In contradistinction, claim 1 claims the present invention as a system for designing a vehicle by enabling dynamic placement of paint spray particles into a flow domain to permit visual observation and alteration of resulting particle trajectories under a computed flow solution over a computer aided design (CAD) model representative of a desired portion of the vehicle represented on a display by a computer having memory, a processor and a user input mechanism associated therewith. The system includes spray gun placement code means operable with the user input mechanism to dynamically effect a desired placement of at least one paint spray gun on the display with respect to the desired portion of the CAD model. The system also includes trajectory determination code means for computing at least one trajectory for a particle stream emanating from the at least one paint spray gun relative to the desired portion of the CAD model for a predetermined set of particle characteristics in a predetermined set of particle external conditions. The system further includes trajectory display code means for effecting display of the

at least one trajectory with respect to the desired portion of the CAD model. Claims 5 and 6 are similar to claim 1 and include other features of the present invention.

The United States Court of Appeals for the Federal Circuit (CAFC) has stated in determining the propriety of a rejection under 35 U.S.C. § 103, it is well settled that the obviousness of an invention cannot be established by combining the teachings of the prior art absent some teaching, suggestion or incentive supporting the combination. See In re Fine, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988); Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 227 U.S.P.Q. 657 (Fed. Cir. 1985); ACS Hospital Systems, Inc. v. Montefiore Hospital, 732 F.2d 1572, 221 U.S.P.Q. 929 (Fed. Cir. 1984). The law followed by our court of review and the Board of Patent Appeals and Interferences is that "[a] prima facie case of obviousness is established when the teachings from the prior art itself would appear to have suggested the claimed subject matter to a person of ordinary skill in the art." In re Rinehart, 531 F.2d 1048, 1051, 189 U.S.P.Q. 143, 147 (C.C.P.A. 1976). See also In re Lalu, 747 F.2d 703, 705, 223 U.S.P.Q. 1257, 1258 (Fed. Cir. 1984) ("In determining whether a case of prima facie obviousness exists, it is necessary to ascertain whether the prior art teachings would appear to be sufficient to one of ordinary skill in the art to suggest making the claimed substitution or other modification.")

None of the references cited, either alone or in combination with each other, teach or suggest the claimed invention of claims 1 through 6. Specifically, Kinema/SIM merely discloses an interactive software tool that presents a simulation space where you can construct and animate complex physical phenomena. Kinema/SIM does not disclose spray gun placement code means operable with a user input mechanism to dynamically effect a desired placement of at least one paint spray gun on a display with respect to a desired portion of a CAD model and trajectory determination code means for computing at least one trajectory for a particle stream

emanating from the at least one paint spray gun relative to the desired portion of the CAD model for a predetermined set of particle characteristics in a predetermined set of particle external conditions. The Examiner even admits on page 9 of the Office Action that Kinema/SIM does <u>not</u> teach simulating paint droplet particle flow past an automobile. Strumolo '404 <u>merely</u> discloses a method and system for predicting sound pressure levels within a vehicle due to wind noise including a wind noise modeler, which is implemented as an Excel spreadsheet that runs on a PC. Strumolo '404 lacks spray gun placement code means operable with a user input mechanism to dynamically effect a desired placement of at least one paint spray gun on a display with respect to a desired portion of a CAD model and trajectory determination code means for computing at least one trajectory for a particle stream emanating from the at least one paint spray gun relative to the desired portion of the CAD model for a predetermined set of particle characteristics in a predetermined set of particle external conditions. The Examiner even admits on page 9 of the Office Action that Strumolo et al. '300 does <u>not</u> teach particle trajectories of paint droplets. Miller et al. '291 <u>merely</u> discloses transient CFD simulations of a bell sprayer in which two numerical models are required in order to analyze the effect of paint transfer efficiency under varying bell operation conditions. Miller et al. '291 lacks spray gun placement code means operable with a user input mechanism to dynamically effect a desired placement of at least one paint spray gun on a display with respect to a desired portion of a CAD model.

Contrary to the Examiner's opinion, Applicants are not claiming an intended use for the present invention. There is absolutely <u>no teaching or suggestion</u> in the art that to provide spray gun placement code means operable with a user input mechanism to dynamically effect a desired placement of at least one paint spray gun on a display with respect to a desired portion of a CAD model and trajectory determination code means for computing at least one trajectory for a particle stream emanating from the at least one paint spray gun relative to the desired portion of

the CAD model for a predetermined set of particle characteristics in a predetermined set of particle external conditions. The Examiner may not, because he/she doubts that the invention is patentable, resort to speculation, unfounded assumptions or hindsight reconstruction to supply deficiencies in the factual basis. See In re Warner, 379 F. 2d 1011, 154 U.S.P.Q. 173 (C.C.P.A. 1967).

The references, if combinable, fail to teach or suggest the combination of a paint spray particle trajectory analysis method and system including spray gun placement code means operable with a user input mechanism to dynamically effect a desired placement of at least one paint spray gun on a display with respect to a desired portion of a CAD model and trajectory determination code means for computing at least one trajectory for a particle stream emanating from the at least one paint spray gun relative to the desired portion of the CAD model for a predetermined set of particle characteristics in a predetermined set of particle external conditions as claimed by Applicants.
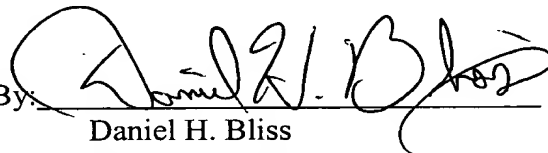
Even if these references could be combined, neither teaches spray gun placement code means operable with a user input mechanism to dynamically effect a desired placement of at least one paint spray gun on a display with respect to a desired portion of a CAD model and trajectory determination code means for computing at least one trajectory for a particle stream emanating from the at least one paint spray gun relative to the desired portion of the CAD model for a predetermined set of particle characteristics in a predetermined set of particle external conditions. Applicants are not attacking the references individually, but are clearly pointing out that each reference is deficient and, if combined (although Applicants maintain that they are not combinable), the combination is deficient. The present invention sets forth a unique and non-obvious combination of a method and system that enables dynamic placement of a paint spray gun into a flow domain to permit visual observation and alteration of resulting paint particle

trajectories with respect to a CAD model representative of the vehicle. Therefore, it is respectfully submitted that claims 1 through 6 are allowable over the rejection under 35 U.S.C. § 103.

Obviousness under § 103 is a legal conclusion based on factual evidence (In re Fine, 837 F.2d 1071, 1073, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988), and the subjective opinion of the Examiner as to what is or is not obvious, without evidence in support thereof, does not suffice. Since the Examiner has not provided a sufficient factual basis, which is supportive of his/her position (see In re Warner, 379 F.2d 1011, 1017, 154 U.S.P.Q. 173, 178 (C.C.P.A. 1967), cert. denied, 389 U.S. 1057 (1968)), the rejection of claims 1 through 6 is improper. Therefore, it is respectfully submitted that claims 1 through 6 are allowable over the rejection under 35 U.S.C. § 103.
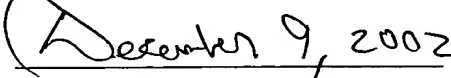
Based on the above, it is respectfully submitted that the claims are in a condition for allowance or in better form for appeal. Applicants respectfully submit that the final rejection is improper and reconsideration and withdrawal of the final rejection be taken. It is respectfully requested that this Amendment be considered and entered under 37 C.F.R. 1.116.

Respectfully submitted,

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